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出 願 人
Applicant(s): 日本電気株式会社

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【発明者】
　【住所又は居所】　東京都港区芝五丁目７番１号　日本電気株式会社内
　【氏名】　イ　ジンソック
【特許出願人】
　【識別番号】　000004237
　【氏名又は名称】　日本電気株式会社
【代理人】
　【識別番号】　100123788
　【弁理士】
　【氏名又は名称】　宮崎　昭夫
　【電話番号】　03-3585-1882
【選任した代理人】
　【識別番号】　100088328
　【弁理士】
　【氏名又は名称】　金田　暢之
【選任した代理人】
　【識別番号】　100106297
　【弁理士】
　【氏名又は名称】　伊藤　克博
【選任した代理人】
　【識別番号】　100106138
　【弁理士】
　【氏名又は名称】　石橋　政幸
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[Claim 1]

A method for controlling transmission power in a mobile communication system which comprises a plurality of mobile stations, a plurality of base stations, and a radio network controller, said method comprising:

a step in which a mobile station transmits a first data flow with a pilot signal to a first group of said base stations with a first power offset to said pilot signal, and a second data flow to a second group of said base stations;

a step in which said base stations of said first group control retransmission of said first data flow, calculate required level of said first power offset based on an occurrence of retransmission, and signal said required level to said radio network controller;

a step in which said base stations of said second group receive second data flow and send the received second data flow to said radio network controller;

a step in which said radio network controller combines the second data flow sent from said base station of said second group, controls said pilot signal power based on reception errors of said second data flow, calculates said first power offset based on said signaled required level of the first power offset and signals said calculated first power offset to said mobile station; and

a step in which said mobile station updates the first power offset to said signaled first power offset.

[Claim 2]

The method according to claim 1, wherein said base station of said first group calculate said required level of said first power offset based on a target error rate of said first data flow.

[Claim 3]

The method according to claim 1, wherein said radio network controller controls said pilot signal power based on a target error rate of said second data flow.

[Claim 4]

The method according to claim 1, wherein said radio network controller:

receives said required level of first power offset from said first group of base stations;

selects a served base station for said mobile station from said first group so that said serving base station receives said first data flow correctly, most frequently,

than other base stations in said group; and

in response to required level of said first power offset from said served base station, calculates said first power offset.

[Claim 5]

The method according to claim 1, wherein said radio network controller increases said power offset based on high priority or high delay sensitivity of said first data flow.

[Claim 6]

The method according to claim 1, wherein said radio network controller signals said calculated first power offset to said first group of base stations.

[Claim 7]

The method according to claim 1 or 6, wherein said first group of base stations sends, by a event-triggering manner, said required power offset, said method further comprising:

a step in which, initially, said radio network controller sets a reporting threshold;

a step in which, continuously, said base stations of said first group calculate a difference between said required power offset and said signaled power offset; and

a step in which said base stations of said first group report said required power offset by detecting that said difference becomes larger than said reporting threshold.

[Claim 8]

A method for controlling transmission power in a mobile communication system which comprises a plurality of mobile stations, a plurality of base stations, and a radio network controller, said method comprising:

a step in which said mobile station transmits a first data flow with a pilot signal to a first group of said base stations with a first power offset to said pilot signal, and a second data flow to a second group of said base stations;

a step in which said base stations of said first group control retransmission of said first data flow, calculate said required level of said first power offset based on a target error rate of said first data flow, and signal said required level to said radio network controller;

a step in which said base stations of said second group receive second data flow, and send the received second data flow to said radio network controller;

a step in which said radio network controller combines second data flow sent from said second group of base stations, and controls said pilot signal power based on a target error rate of said second data flow, receives said required level of first power offset from said first group of base stations, calculates first power offset based on said signaled required level of first power offset in response to required level of said first power offset from a served base station, increases said power offset based on high priority or high delay sensitivity of said first data flow, signals said calculated first power offset to said mobile station, and signals said calculated first power offset to said first group of base stations; and

a step in which said mobile station updates the first power offset to said signaled first power offset,

wherein said served base station for said mobile station is a base station in said first group receiving said first data flow correctly, most frequently, than other base stations in said group.

[Claim 9]

The method according to claim 1, wherein said mobile station transmits said second data flow with a second power offset to said pilot signal signaled by said radio network controller.

[Claim 10]

A method for controlling transmission power in a mobile communication system which comprises a plurality of mobile stations, a plurality of base stations, and a radio network controller, said method comprising:

a step in which a mobile station transmits a first data flow with a pilot signal to a first group of said base stations with a first power offset to said pilot signal, transmits a second data flow to a second group of said base stations, and transmits, in addition to said first data flow, a third data flow with said pilot signal to said first group with a third power offset to said pilot signal;

a step in which said mobile station chooses transmission of either first or third data flow in a time interval but not simultaneously together;

a step in which said base stations of said first group control retransmission of both said first data flow and said third data flow, separately calculate required level of said first and third power offsets based on an occurrence of retransmission of said first and third data flows, respectively, and signal said two required levels to said radio network controller;

a step in which said base stations of said second group receive second data flow and send the received second data flow to said radio network controller;

a step in which said radio network controller combines the second data flow sent from said base station of said second group, controls said pilot signal power based on reception errors of said second data flow, calculates said first and third power offsets based on said signaled required levels of the first and third power offsets, respectively, and signals said calculated first and third power offsets to said mobile station; and

a step in which said mobile station updates the first and third power offsets to said signaled first and third power offsets, respectively.

[Claim 11]

The method according to claim 10, wherein said first and said third data flow have distinct Quality of Service (QoS).

[Claim 12]

The method according to claim 11, the Quality of Service includes priority and delay sensitivity.

【書類名】外国語明細書

[Title of the Invention] Transmission power control method of uplink packet data transmission

[Technical Field]

This invention is related to uplink data packet transmission in wideband code division multiple access (WCDMA) technology. In particular, this invention is closely related to further enhancement of uplink dedicated transport channel (EUDCH). Aiming to improve the transmission efficiency of uplink packet, the EUDCH includes new base station functions such as fast retransmission and scheduling of uplink data packet data.

[Background Art]

In a WCDMA system, the radio network controller (RNC) controls the data rate of uplink packet data transmission for a multiplicity of mobile stations (MS). The radio network controller scheduling of uplink data rate can be combined with base station (BTS) scheduling in order to achieve better radio link efficiency and therefore higher system capacity. One example of this combination of RNC and BTS packet scheduling is the so-called Enhanced Dedicated Channel (EUDCH). We refer here non-patent reference [1].

In addition to packet scheduling capability at a base station, EUDCH considers a base station to have ARQ (automatic retransmission) capability in order to request a retransmission of an erroneous data packet directly to the mobile station without the involvement of the radio network controller. Generally, BTS ARQ is much faster than RNC ARQ, hence the former outperforms the latter in terms of its required delay for a retransmission.

When a mobile station has multiple uplink data flows, it is possible to use a different scheduling method for the different data flow depending on the requirement of the flow. For example, if the BTS scheduling is optimized for mainly a best-effort service while a voice call service can be better controlled by the RNC scheduling, the mobile station is able to transmit multiple data flows using appropriate scheduling mode to meet the requirement of each data flow.

Figure 1 gives an illustration of a system with BTS/RNC scheduling and ARQ. Three types of mobile stations (MS1 to MS3) 101 to 103 in a cell are connected to base station (BTS) 104 which is controlled by radio network controller (RNC) 105. Two mobile stations (MS2, MS3) 102, 103 are BTS scheduled mobile stations while

other two mobile station (MS1, MS3) 101, 103 are scheduled by radio network controller 105. Note that MS3 103 has two data flows and each flow has different scheduling mode. In other words, MS3 103 has two uplink data flows while each of MS1 101 and MS2 102 has one uplink data flow. Hence the data rate of MS2 102 and the first flow of MS3 103 are controlled by base station 104 while radio network controller 105 controls those of MS1 101 and the second flow of MS3 103. Similarly, the retransmission of MS2 102 and the first flow of MS3 103 are requested by the base station while the radio network controller controls the retransmission of MS1 101 and the second flow of MS3 103. It is important to note that MS1 101 is connected to both base stations 104, 104A at the same time and radio network controller 105 combines a received data packet from two base stations 104, 104A.

When a mobile station transmits two data packet flows using both BTS and RNC scheduling simultaneously, assuming the user is making a voice call while sending a multimedia message, the transmission power of two data flows should be appropriately controlled. In the example of the aforementioned EUDCH, the transmission power of two data flows, denoted by DCH (dedicated channel) and EUDCH (enhanced dedicated channel), can be conventionally controlled in the following manner:

$$P_{cch}(t) = P_{cch}(t\text{-}1) + \Delta_{cch}(t) \qquad (1)$$

$$P_{dch}(t) = PO_{DCH}\, P_{cch}(t)$$

$$P_{eudch}(t) = PO_{EUDCH}\, P_{cch}(t)$$

where PO_{DCH} and $P_{dck}(t)$ are the transmission power offset and transmission power at time t of DCH (RNC scheduled data flow) while PO_{EUDCH} and $P_{eudch}(t)$ are those of EUDCH (BTS scheduled data flow). The power offset of DCH and EUDCH are controlled in a semi-static manner by the radio network controller while the transmission power of pilot signal $P_{cch}(t)$ is controlled by both inner and outer loop control. More specifically, $\Delta_{cch}(t)$ composes of inner and outer loop adjustment factors. We refer both adjustment algorithms included in non-patent reference [2].

[Non-patent reference [1]] 3GPP TR 25.896 V1.2.1 (2004-01) Technical Report 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Feasibility Study for Enhanced Uplink for UTRA FDD; (Release 6)

[Non-patent reference [2]] 3GPP TS 25.214 V5.6.0 (2003-09) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Physical layer procedures (FDD) (Release 5)

[Disclosure of the Invention]

[Problems to be solved by the Invention]

When base station level ARQ is enabled, the control of the transmission power shown in Equation 1 has the following problems:

(1) Interaction of Power Control and BTS ARQ:

When a base station controls ARQ process, the radio network controller should set an appropriate power offset for a BTS scheduling data packet (EUDCH data flow). If the power offset is set too large, a very low error probability can occur so that there is no benefit of having the base station level ARQ processing. If the power offset is set too low, a large error probability would increase the total latency of the uplink data packet transmission. To make this problem more difficult, if the data packet frame lengths of DCH and EUDCH are different, the radio network controller should also anticipate a difference in interleaving gain of DCH and EUDCH. For example, if the moving speed of the mobile station changes randomly in time, so does the interleaving gain of DCH and EUDCH.

(2) Interaction of Power Control and Soft Handover in Uplink:

The transmission power control for DCH and EUDCH data flows should enable high link efficiency even when there is a difference of soft handover gain of DCH and EUDCH. For example, when a DCH data flow is received by two base stations while only one base station receives an EUDCH data flow, the transmission power control should control the transmission power of both DCH and EUDCH in a "simultaneously efficient" way. If it optimizes for only either one of DCH and EUDCH, the link quality on the other channel would degrade. To make the problem more difficult, the number of base stations receiving the DCH and EUDCH data flows changes randomly and frequently as the mobile station moves around the network.

The object of the present invention is to provide a transmission power control method which can simultaneously achieve efficient transmission of each of a plurality of data flows.

[Means for Solving Problem]

The object of the present invention is achieved by a method for controlling transmission power in a mobile communication system which comprises a plurality of mobile stations, a plurality of base stations, and a radio network controller, wherein

a mobile station transmits a first data flow with a pilot signal to a first group of the base stations with a first power offset to the pilot signal, and a second data flow

to a second group of the base stations;

the base stations of the first group control retransmission of the first data flow, calculate required level of the first power offset based on an occurrence of retransmission, and signal the required level to the radio network controller;

the base stations of the second group receive second data flow and send the received second data flow to said radio network controller;

the radio network controller combines the second data flow sent from the base station of the second group, controls the pilot signal power based on reception errors of the second data flow, calculates the first power offset based on the signaled required level of the first power offset and signals the calculated first power offset to the mobile station; and

the mobile station updates the first power offset to the signaled first power offset.

[Effect of the Invention]

The present invention solves the problem related to fast change of a difference in the interleaving gain between two data flows due to a different frame length of two flows. When two data flows have a different frame length, the conventional technique allow to adjust the transmission power of both flows only optimized for either one of the data flows hence inefficient for the other flow. The present invention adjusts the transmission power of each data flow, simultaneously, to meet efficiency of respective data flows. This benefit is explained in Figure 2, using example of an EUDCH system, that the transmission power of EDH data flow is controlled based on the reception status at the radio network controller while the transmission power of the EUDCH data flow is controlled based on the reception status at the base station.

In addition, the present invention solves the problem related to fast change of difference in macro-diversity gain between two data flows due to a different number of receiving base stations of two flows. When two data flows have a different number of the receiving base stations, the conventional technique allow only to adjust the transmission power of both flows only optimized for either one of the data flows hence inefficient for the other flow. According to the present invention, the transmission power of each data flow is adjusted simultaneously to meet efficiency of respective data flow. This benefit is explained in Figure 2 and Figure 5, using example of the EUDCH system. The transmission power of the EDH data flow is

controlled based on the combined reception status at the radio network controller, after receiving the DCH data flow by a group of base stations, while the transmission power of the EUDCH data flow is controlled based on the reception status at the second group of base stations.

[Best Mode for Carrying out the Invention]

Figure 2 illustrates one possible realization of the system according to the present invention including RNC/BTS ARQ and transmission power control. As an example, aforementioned EUDCH is considered and the illustrated system comprises one mobile station (MS) 10, one base station (BTS) 20 and one radio network controller (RNC) 30.

Mobile station 10 is provided with CCH pilot transmitter (CCH Tx) 201, DCH data frame transmitter (DCH Tx) 202, EUDCH data frame transmitter (EDCH Tx) 203, power offset controller (PO) 204, inner loop power controller (IL IPC) 205, ARQ transmitter (ARQ Tx) 206 for EUDCH data frame, and ARQ transmitter (ARQ Tx) 207 for DCH data frame. The mobile station transmits the common pilot signal CCH generated by transmitter 201, RNC scheduled DCH data flow generated by transmitter 202, and BTS scheduled EUDCH data flow generated by transmitter 203. Respective power offsets of each flow are controlled by power offset controller 204 and these data flows are combined as a transmission signal of mobile station 10. Then inner loop power controller 205 controls the total transmission power of mobile station 10 (see Equation 1). Uplink data transmission 221 between mobile station 10 and base station 20 is established.

Base station 20 is provided with data frame demultiplexer (DEMUX) 208, pilot signal receiver (CCH Rx) 209, DCH frame decoder (DCH DEC) 210, EUDCH frame decoder (EDCH DEC) 211, downlink TPC command generator (TPC) 212, ARQ receiver (ARQ Rx) 213 for EUDCH data frame, and power offset estimator (POE) 214. Radio network controller 30 is provided with ARQ receiver (ARQ Rx) 215 for DCH data frame, outer loop TPC controller (OL TPC) 216, DCH frame receiver (DCH Rx) 217, EUDCH frame receiver (EDCH Rx) 218, and radio resource controller (RRC) 219.

The base station receives both transmitted data flows and demultiplexed them into separate processing chain by demultiplexer 208. Firstly CCH is decoded by decoder 209 and processed by downlink TPC command generator 212, which generates the power control commands (downlink TPC commands) 220. Commands

220 are sent to inner loop power controller 212 in mobile station 10. RNC scheduled DCH flow is decoded by decoder 210 and then decoded RNC scheduled DCH flow 224 is forwarded to radio network controller 217 at radio network controller 30 via a BTS-RNC interface. The retransmission controller, i.e., ARQ receiver 215, at radio network controller 30 requests erroneous DCH data packets back from mobile station by notifying ARQ transmitter 207 at mobile station 10. Also reception status of DCH is used by outer loop power control 216, which controls the target signal-to-noise ratio (SIR) 223 of the base station power controller, i.e., TPC command generator 212, via a control signalling interface. The decoding of BTS scheduled EUDCH data packet is performed by EUDCH decoder 211 and decoded EUDCH data frame 225 is forwarded to EUDCH frame receiver 218 at radio network controller 30. EUDCH decoder 211 forwards the reception status of EUDCH to the retransmission slave controller, i.e., ARQ receiver 213, located in base station 10. ARQ receiver 213 communicates with the retransmission master controller, i.e., ARQ transmitter 206, at mobile station 10 as downlink ARQ feedback 222. For further details of the system shown in Figure 2, we refer non-patent references [1] and [2].

The following is a detail description of a process performed in power offset estimator 214 in base station 20. Figure 3 is a flow chart illustrating the description presented in the following. In the drawings, "TarBler", "DelAck" and "DelNack" represent a target error rate, a positive adjustment factor for the power offset, and a negative adjustment factor for the power offset, respectively. "DelAnack", "AccDel", "RecPO" and "AssPO" represents an adjustment factor, an accumulated adjustment factor, a required power offset, and an assigned power offset, respectively. "K31" is a given value of DelAck and "K32" is a maximum allowed power offset.

Initially, the target error rate of the EUDCH data flow is set as well as an adjustment factor for power offsets in step 301. The adjustment factor should be sufficiently large to guarantee fast convergence of adjustment. After EUDCH data packet is decoded by base station at step 302, a required power offset is adjusted by the reception status of the data packet at steps 303, 304, 305 and 306. This adjustment is accumulated over a period of time and required power offset is calculated as follows at steps 306, 307, 308:

$$PO_{REC} = \min\left(PO_{EDCH} + \sum_{t \in T_{MSR}} \Delta_{anck}(t), PO_{MAX} \right) \qquad (2)$$

The PO_{REC} is the calculated required power offset of EUDCH during measurement period T_{MSR}. The measurement duration and the maximum upper limit of power offset PO_{MAX} are predefined by the radio network controller. The maximum upper limit PO_{MAX} guarantees a defined dynamic range of the power offset for the EUDCH data flow. Furthermore, the adjustment term Δ_{anck} is decided based on of the reception state of EUDCH such that:

$$\Delta_{anck}(t) = \begin{cases} \Delta_{ACK} & \textit{if successful transmission (ACK)} \\ -\Delta_{NACK} & \textit{if not successful transmission (NACK)} \end{cases} \qquad (3)$$

Note that the adjustment in Equation 2 can be selectively performed. For example, if there is no data reception or there is retransmission at time t, then $\Delta_{anck}(t) = 0$. The adjustment parameters, Δ_{ACK} and Δ_{NACK}, can be defined by the following equation:

$$(1-P_{nack})\ \Delta_{ACK} = P_{nack}\ \Delta_{NACK} \qquad (4)$$

where P_{nack} is the target block error rate (BLER).

After the base station performs the power offset estimation procedure describe above, it, then, reports the calculated required power offset to the radio network controller at step 309. Concretely, power offset estimator 214 forwards reported power offset 227 to radio resource controller 219 which signals the power offset to power offset controller 204 in mobile station 10 as indicated by arrow 226. If the assigned power offset is set in the radio network controller, the base station reads the assigned power offset from the radio network controller at step 310. Then the control of procedure goes back to step 302.

Although the frequent reporting of required power offset to the radio network controller is beneficial, its associated signaling overhead can be significant. To reduce the signalling overhead, an event driven signaling is described in the following. Figure 4 illustrates a detail example of event driven signalling procedure. In Figure 4, "DiffPO" represents a difference of the power offsets, and "K41" is a threshold for the power offset reporting.

After calculation of the required power offset is carried out at step 401, the base station calculates a difference between the calculated power offset and the assigned power offset at step 402. If the difference is greater than a pre-defined reporting threshold, base station 20 sends the calculated power offset to radio network controller 30 at step 403.

$$\log_{10}\left|PO_{RNC} - PO_{REC}\right| > PO_{REPTH} \qquad (5)$$

where PO_{RNC} and PO_{REC} are the current and required power offset respectively while PO_{REPTH} is a threshold for power offset reporting. The pre-defined reporting threshold can be signaled from radio network controller to base station.

From the method described so far, the radio network controller can have reporting from a base station on the required power offset of the EUDCH data flow. From this recommendation from the base station, it can decide a new power offset of the EUDCH data flow. A detail procedure of the radio network controller assigning the new power offset is described in what follows:

A flow chart of this radio network controller procedure is given in Figure 5. Firstly, the radio network controller receives a required power offset from a group of base stations receiving EUDCH data flow, at step 501, and calculates a difference between the newly required power offset and the currently assigned power offset at step 502. Then the radio network controller checks at step 503 whether the required power offset is sent by a serving base station which receives EUDCH data packets most frequently than other base stations. If not the serving base station, the radio network controller rejects the reported required power offset at step 508. If the power offset is sent by the serving base station, the radio network controller checks whether required power offset is smaller than currently assigned power offset at step 504. If so, the radio network controller accepts the recommendation and sends newly assigned power offset to the base stations at steps 505, 509. If not, the radio network controller accept the recommendation if the data flow is a high priority flow or delay sensitive at steps 506, 507. Otherwise, the radio network controller rejects the required power offset at step 508.

In the method described in Figure 5, the radio network controller is utilizing priority and delay sensitivity of data flow when it decides to increase the required power offset. The benefit associated with this procedure is that limited total radio resource is prioritized to serve the high priority flow or delay sensitive flow rather than the low priority best-effort flow.

Furthermore in the method described in Figure 5, the radio network controller accepts the required power offset only from the served base station. The benefit of this procedure is to minimize the required power offset by selecting the best quality base station hence increasing capacity of uplink packet transmission.

Next, another embodiment of the present invention will be described. As an example, aforementioned EUDCH is considered hereafter. Figure 6 illustrates

another possible realization of the system according to the present invention. This illustrated system is an extension of the previous realization of system shown in Figure 2. The difference between two systems are explained in the following:

There are two EUDCH data flows in addition to one DCH data flow. The previous system in Figure 2 has only one EUDCH data flow. Therefore system in Figure 6 is an extended system for the case when there are more than on EUDCH data flows transmitted in uplink. Each EUDCH data flow may have different requirement on target error rate due to different Quality of Service (QoS) requirement. To support different QoS for each data flow, in this system, transmitted data packet from each data flow is separately encoded.

Therefore, mobile station 10 shown in Figure 6 provided with two EUDCH data transmitters (EDCH1 Tx, EDCH2 Tx) 601, 602 and time multiplexer (SW) 604 for two data flows. Base station provided with two power offset estimators (POE1, POE2) 607, 608.

Separate power offsets for two EUDCH data flows are used in power offset controller 603 for DCH data flow and two EUDCH data flows. Instead of using a common power offset for both EUDCH data flows, in this embodiment, the separate power offsets are used in order to control the target error rate of each EUDCH data flow separately. Hence controlling separate QoS of each EUDCH data flow is possible by use of the separate power offset for each flow.

Time multiplexing is used for transmitting two EUDCH data flows. The switching at time multiplexer 604 is performing selection for transmission from two data flows. For example, switching can perform round robin selection from between two data flows when both flows have sufficient data waiting for transmission. In order to separately control the target error rate of each data flow

Based upon receiving the transmitted EUDCH data flow, base station 20 performs decoding of EUDCH data flow at EUDCH decoder 606. Successfully decoded data is forwarded to RNC 30 and the reception status of data flow is reported to power offset estimators 607, 608. As described above, there are two separate power offset estimators 607, 608 in the base station for each EUDCH data flow. Hence the reception status of EUDCH data flow is updated to the corresponding power offset estimator only. For example, if the base station receives the first EUDCH data flow, the power offset estimator updating the power offset of the first EUDCH data flow will calculate new level of the required power offset using the

reception status. The calculation is carried out by the same procedure illustrated in Figure 3.

Both base station 20 and mobile station 10 are controlling retransmission of data flow by a master controller, i.e., ARQ transmitter 605, and a slave controller, i.e., ARQ receiver 609. ARQ transmitter 605 functions as a retransmission master controller at the mobile station handling both EUDCH data flows, and ARQ receiver 609 functions as a retransmission slave controller at the base station handling both EUDCH data flows. To support separate retransmission of two EUDCH data flow, retransmission information consists of the reception status and corresponding data flow identification. The identification can be sent explicitly or it can be reduced implicitly from fixed timing between the uplink data transmission and the downlink control data transmission.

The separate power offsets for two EUDCH data flows calculated by base station are reported to RNC radio resource controller 610. Based on the reported power offset, RNC 30 makes decision on the power offset of each EUDCH data flow in a same way explained in Figure 5. For example, if two EUDCH data flow has different priority and base station 20 reports higher power offsets for both data flows, then RNC can increase only the power offset of the higher priority data flow while rejecting that of the lower priority one. Then RNC signals newly assigned power offsets to the mobile station and base station(s).

Key aspect of the proposed realization in Figure 6 is to employ two separate closed control loop for each EUDCH data flow. The base station calculates the required power offset for each data flow separately, it reports the power offsets to the radio network controller separately and then the radio network controller makes the decision on new power offset also separately. This separate closed loop power offset control enables the separate control of QoS of each data flow hence the data flow with high priority, for example, can be guaranteed more uplink power than that of lower priority. Note that this proposed system can be also extended for a case when there are more than two EUDCH data flows.

[Brief Description of the Drawings]

[Figure 1] Figure 1 is a block diagram illustrating a system with RNC scheduling and BTS scheduling uplink data packet transmission.

[Figure 2] Figure 2 is a block diagram illustrating a system according to an embodiment of the present invention.

[Figure 3] Figure 3 is a flow chart of the base station procedure of calculating required power offset.

[Figure 4] Figure 4 is a flow chart of the base station procedure of sending required power offset.

[Figure 5] Figure 5 is a flow chart of the radio network controller procedure of assigning new power offset.

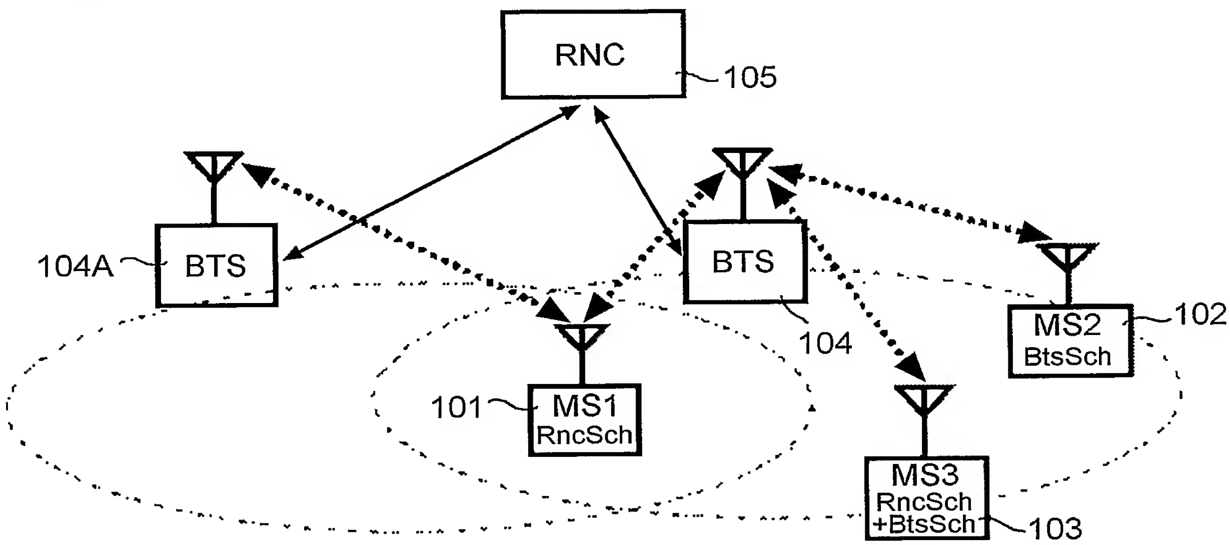
[Figure 6] Figure 6 is a block diagram illustrating a system according to another embodiment of the present invention.

[Description of the reference numerals]

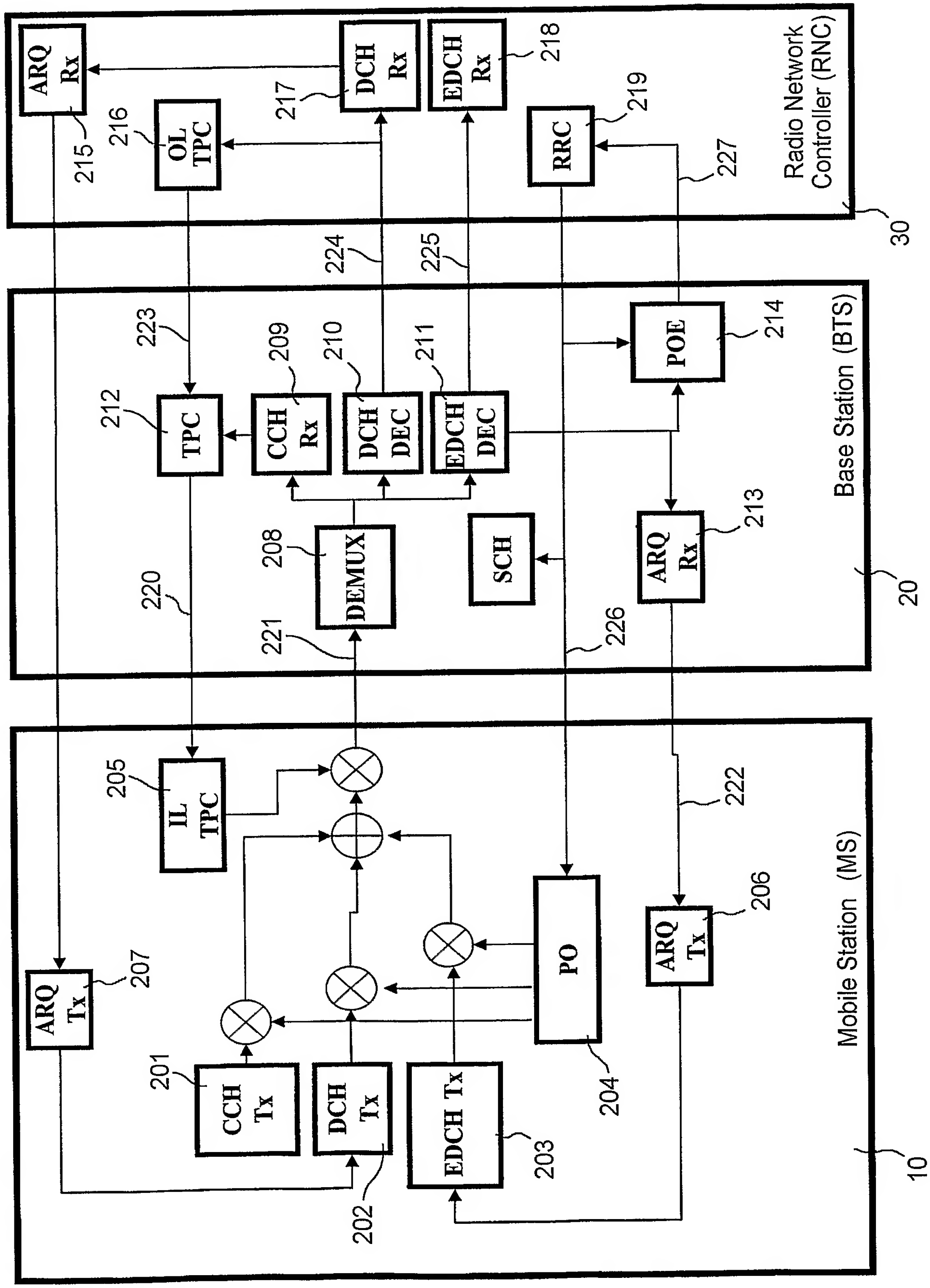
10, 101, 102, 103 Mobile station (MS)
20, 104, 104A Base station (BTS)
30, 105 Radio network controller (RNC)
201 CCH pilot transmitter
202 DCH data frame transmitter
203, 601, 602 EUDCH data frame transmitter
204, 603 Power offset controller
205 Inner loop power controller
206, 207, 605 ARQ transmitter
208 Data frame demultiplexer
209 Pilot signal receiver
210 DCH frame decoder
211, 606 EUDCH frame decoder
212 Downlink TPC command generator
213, 215, 609 ARQ receiver for EUDCH data frame
214, 607, 608 Power offset estimator
216 Outer loop TPC controller
217 DCH frame receiver
218 EUDCH frame receiver
219, 610 Radio resource controller
604 Time multiplexer

【書類名】外国語図面

[FIGURE 1]

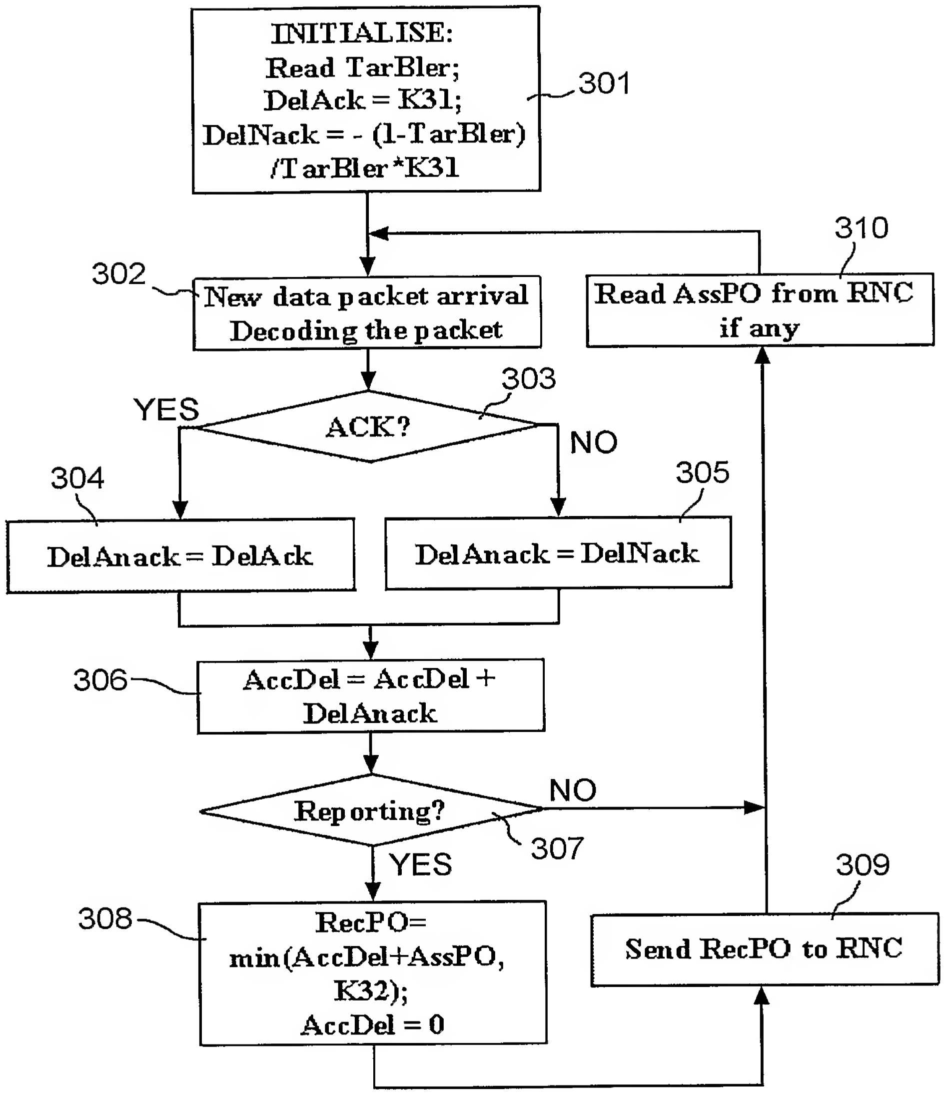


[FIGURE 2]

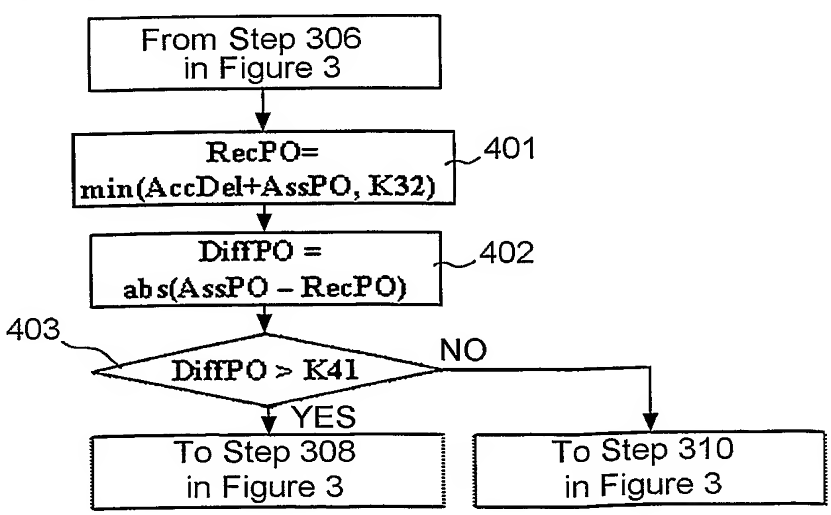


ARQ Rx
215
OL TPC
216
DCH Rx
217
EDCH Rx
218
RRC
219
227
Radio Network Controller (RNC)
30
224
225
223
TPC
212
CCH Rx
209
DCH DEC
210
EDCH DEC
211
POE
214
DEMUX
208
SCH
ARQ Rx
213
220
221
226
Base Station (BTS)
20
IL TPC
205
222
PO
204
ARQ Tx
206
ARQ Tx
207
CCH Tx
201
DCH Tx
202
EDCH Tx
203
Mobile Station (MS)
10

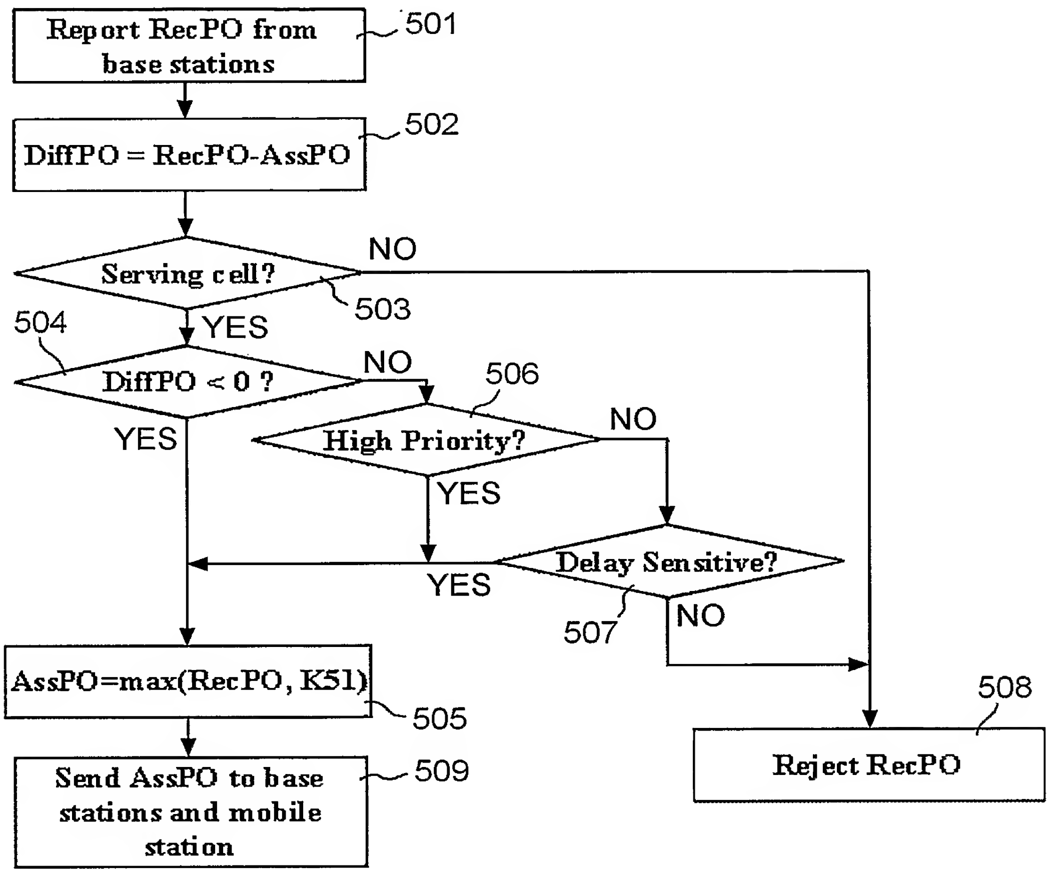
[FIGURE 3]



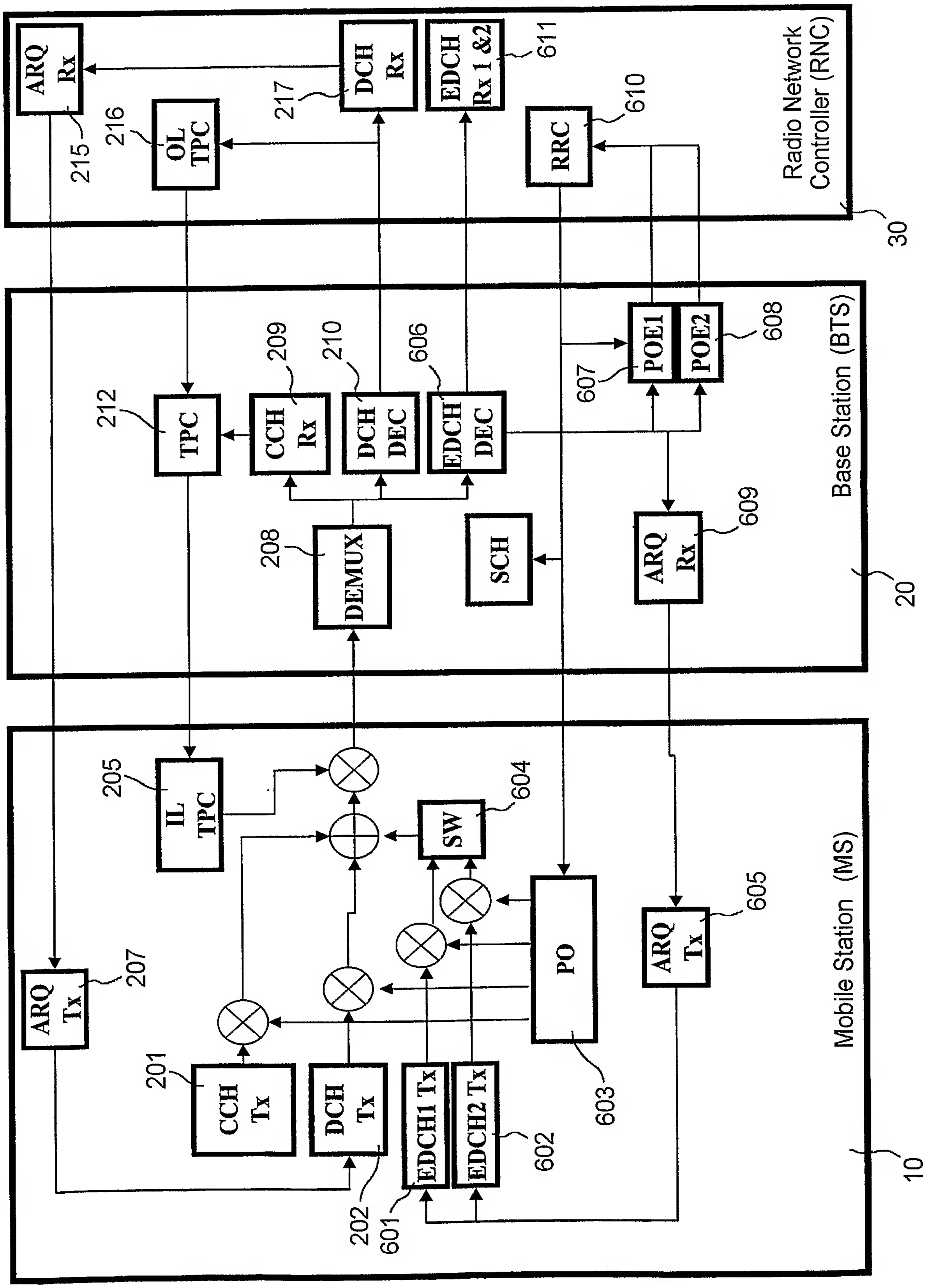
[FIGURE 4]



[FIGURE 5]


Report RecPO from base stations
501
DiffPO = RecPO-AssPO
502
Serving cell?
503
NO
YES
504
DiffPO < 0 ?
NO
YES
506
High Priority?
NO
YES
Delay Sensitive?
YES
NO
507
AssPO=max(RecPO, K51)
505
Send AssPO to base stations and mobile station
509
508
Reject RecPO

[FIGURE 6]


ARQ Rx
215
OL TPC
216
DCH Rx
217
EDCH Rx 1 &2
611
RRC
610
Radio Network Controller (RNC)
30
TPC
212
CCH Rx
209
DCH DEC
210
EDCH DEC
606
POE1
POE2
607
608
DEMUX
208
SCH
ARQ Rx
609
Base Station (BTS)
20
IL TPC
205
SW
604
PO
603
ARQ Tx
605
ARQ Tx
207
CCH Tx
201
DCH Tx
202
EDCH1 Tx
601
EDCH2 Tx
602
Mobile Station (MS)
10

【書類名】外国語要約書

[Abstract]

[Problem] To provide a transmission power control method which can simultaneously achieve efficient transmission of each of a plurality of data flows.

[Solving Means] Mobile station 10 transmits a first data flow with a pilot signal to a first group of base stations with a first power offset, and a second data flow to a second group of base stations. Radio network controller 30 controls the pilot signal power based on reception errors of the second data flow, calculates the first power offset based on signaled required level of the first power offset from the base stations 20 of the first group which calculate required level of the first power offset based on an occurrence of retransmission, signals the calculated first power offset to mobile station 10.

[Representative Drawings] Figure 2

特願２００４－１７９８３１

出　願　人　履　歴　情　報

識別番号　　　　　　［０００００４２３７］

１．変更年月日　　　１９９０年　８月２９日
　　［変更理由］　　新規登録
　　　　住　所　　　東京都港区芝五丁目７番１号
　　　　氏　名　　　日本電気株式会社